

Review of: "The Case for Conscious Experience Being in Individual Neurons"

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Unfortunately, I have nothing positive to say about this article, other than the fact that the topic itself is interesting in relevant. However, I find the arguments used by the authors full of jargon, drawing on concepts from other areas of science, which they attempt to integrate into a neuroscience discussion (e.g. quantum mechanics). I also find the authors knowledge of neuroanatomy, neurophysiology, and systems neuroscience too novice for this discussion. Related, the level of scholarship demonstrated here is weak, serving to cite the author previous works more than draw on a broad and relevant discussion of topic.

As one example, I would encourage the authors to consider the brain from a region specific view of things we know tied to function. Classic lesion studies have taught us a great deal. If I lesion your visual cortex, you will have deficits in conscious perception related to what you are visually observing. If I lesion your hypothalamus, your perceptions may all still be intact, but regulating bodily processes will be caput. So consider whether your hypothalamic neurons are “conscious” or not.

Along these lines, there is a great wealth of literature about distributed sensory processing by modality (e.g. somatosensory, visual, auditory) in separate brain regions along segregated processing streams. These processing streams come together in very specific ways to solve the binding process you elude to as un-solvable (it is in fact well understood, though more work to be done). So is a visual neuron “conscious” but devoid of consciousness pertaining to touch?? In general, such a line of reasoning is worthless and fails to capture the hierarchical organization of the brain.

Towards that end, the hierarchy doesn't have to have an “end”, or a single place where it all converges, consciousness may not be the overall evolutionary goal of making neural circuits. It is to sense and act in the goal of survival and reproduction. As such, the nervous system is sensory in to motor out. Consequently, there is a hierarchy of individual modalities that integrate and places where “higher order” processes occur (again, see classic lesion studies). Finally, there are interesting neural circuits that can allow for the competing multiple perceptual possibilities to collapse into a single unified conscious percept, and I would look to Aoki et al. eLife 2019 on converging cortico-basal ganglia loops.

Lastly, to be helpful with some places you could try to take your argument. Let's think about organisms with very simple nervous systems and scale up. Is a simple cell culture network in a dish conscious? What about the 302 neuron circuit in a C elegans?? I would tend to say that the essential basis of conscious experience is something that emerges from the complexity of a neural circuit, but to quote Daniel Dennet (whom you erroneously cite in your article), asking if one neuron is conscious is akin to asking if one water molecule is wet. The concept is an emergent phenomena of the network interactions.

Also, if you want some interesting support for your idea, look to the work of Michale Brecht. He had two great Nature papers 20 years ago performing single neuron intracellular stimulation in awake behaving rats. When stimulating a single neuron in the somatosensory cortex, he discovered the animals could perceive this. My view is that stimulating one neuron sets off a broad network, so its still not one neuron being conscious. In support of that, Brecht's second paper showed stimulating a single neuron in motor cortex was capable of eliciting movement of the body. Speaks to the power of a single neuron and you find the work useful in your arguments.